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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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8791	7590	11/29/2006	EXAMINER	
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				ART UNIT
				PAPER NUMBER
				2841

DATE MAILED: 11/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/625,216	DISHONGH ET AL.	
	Examiner	Art Unit	
	Jeremy C. Norris	2841	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 05 September 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 31-62 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 31-62 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 24 January 2005 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 31, 32, 36, 37, 47, 48, 53, 58, 59, and 61 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5,680,701 (Sippel).

Sippel discloses, referring primarily to figures 3A-H a printed circuit board (PCB) comprising: a first signal routing layer (3) formed on a first surface of the PCB; an electrically conductive layer (3), at least one padless via (4, col., lines 30-40) extending from the first signal routing layer to the electrically conductive layer, the at least one padless via in electrical contact with the electrically conductive layer and a layer of solder mask material (7) formed over the first signal routing layer, the layer of solder mask material having at least one opening to expose the at least one padless via [claim 31], wherein the electrically conductive layer comprises the second signal routing layer and the at least one padless via is in electrical contact with a conductive trace on the second signal routing layer [claim 32], wherein the electrically conductive layer comprises a conductive plane, and the at least one padless via is in electrical contact with the conductive plane [claim 58].

Similarly, Sippel discloses, referring primarily to figures 3A-H, a printed circuit board (PCB) comprising: a first signal routing layer (3) formed on a first surface of the

PCB; at least one electrically conductive layer (3), and an array of interconnections formed on the first surface of the PCB, the array of interconnections including at least one padless via (4, col. 4, lines 30-40) extending from the first signal routing layer to the at least one electrically conductive layer, wherein the padless via is in electrical contact with the at least electrically conductive layer, [claims 36, 47], wherein the at least one electrically conductive layer comprises the second signal routing layer and the at least one padless via is in electrical contact with a conductive trace on the second signal routing layer [claims 37, 48], wherein forming an array of interconnections on the first surface of the PCB comprises forming at least one contact pad on the first surface of the PCB adjacent to the at least one padless via, the at least one contact pad in electrical contact with a conductive trace on the first signal routing layer [claim 53], wherein the electrically conductive layer comprises a conductive plane, and the at least one padless via is in electrical contact with the conductive plane [claims 59, 61].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 35, 41-44, 46, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sippel in view of US 5,418,689 (Alpaugh).

Regarding claim 35, Sippel discloses the claimed invention as described above with respect to claim 35 except, Sippel does not specifically disclose a component attached to the PCB by a solder interconnection between a contact pad on a bottom surface of the component and the at least one padless via [claim 35]. However, it is well known in the art to attach components to PCB in this manner to vias as evidenced by Alpaugh (see col. 4, 50-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to attach a chip to the PCB in the invention of Sippel. The motivation for doing so would have been to allow for signal processing.

Regarding claim 41, Sippel discloses, referring to figure 12, a system comprising: a printed circuit board (PCB) including a first signal routing layer (3) formed on a first surface of the PCB, at least one electrically conductive layer, and an array of interconnections formed on the first surface of the PCB, wherein the array of interconnections includes at least one padless via (4, col. 4, lines 30-35) extending from the first signal routing layer to the at least one electrically conductive layer, the at least one padless via electrically connected to the at least one electrically conductive layer. Sippel does not specifically disclose a component attached to the PCB by a plurality of solder ball interconnections between the array of interconnections formed on the first surface of the PCB and a corresponding array of contact pads disposed on a bottom surface of the electronic component [claim 41]. However, it is well known in the art to attach components to PCB in this manner to vias as evidenced by Alpaugh (see col. 4, 50-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to attach a chip to the PCB in the invention of Sippel. The motivation for doing so would have been to allow for signal processing.

Additionally, the modified invention of Sippel teaches wherein the at least one electrically conductive layer comprises the second signal routing layer and the at least one padless via is in electrical contact with a conductive trace on the second signal routing layer [claim 42], further comprising at least two conductive traces on the first signal routing layer routed between the at least one padless via and an adjacent interconnection [claim 43], wherein the PCB is a motherboard and the component is a

processor [claim 46], wherein the electrically conductive layer comprises a conductive plane, and the at least one padless via is in electrical contact with the conductive plane [claim 60].

Furthermore, while the modified invention of Sippel does not specifically teach that the width of the traces is approximately 3 mils [claim 44], instead generically teaching that the traces are "fine-line" (col. 3, lines 1-10), it would have been obvious to one having ordinary skill in the art at the time of invention to make the width 3 mils. The motivation for doing so would have been to provide a conductor of width sufficient to handle the require signal propagation, yet small enough to avoid wasting board space (col. 1, lines 45-55). Moreover, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering that optimum or workable ranges involves only routing skill in the art. *In re Aller*, 105 USPQ 233.

Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sippel in view of US 6,555,208 (Takada).

Regarding claim 39, Sippel discloses the claimed invention as described above except Sippel does not specifically state that contact pad is has a diameter of less than 18 mils [claim 39]. However, it is well known in the art to comprise contact pads in this size range as evidenced by Takada (see col. 16, lines 15-20). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to make the pad in the invention of Sippel less then 18 mils in diameter. The motivation for doing so

would have been to reduce the footprint of the pad to allow for greater signal wiring density. Moreover, it has been held that more than a mere change of form is necessary for patentability. *Span-Deck, Inc v. Fab-con, Inc.* (CA 8, 1982) 215 USPQ 835.

Similarly, regarding claim 40, Sippel discloses the claimed invention as described above except Sippel does not specifically state that the padless via has a diameter of 12 mils or less [claim 40]. However, it is well known in the art to comprise padless vias in this size range as evidenced by Takada (see col. 14, lines 20-30). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to make the padless via in the invention of Sippel less than 12 mils in diameter. The motivation for doing so would have been to reduce the footprint of the pad to allow for greater signal wiring density. Moreover, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering that optimum or workable ranges involves only routing skill in the art. *In re Aller*, 105 USPQ 233.

Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sippel in view of Alpaugh as applied to claim 41 above, and further in view of Takada.

Regarding claim 45, the modified invention of Sippel teaches the claimed invention as described above except the modified invention of Sippel does not specifically state that contact pad is has a diameter of less than 18 mils [claim 45]. However, it is well known in the art to comprise contact pads in this size range as evidenced by Takada (see col. 16, lines 15-20). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to make the pad in the

modified invention of Sippel less than 18 mils in diameter. The motivation for doing so would have been to reduce the footprint of the pad to allow for greater signal wiring density. Moreover, it has been held that more than a mere change of form is necessary for patentability. Span-Deck, Inc v. Fab-con, Inc. (CA 8, 1982) 215 USPQ 835.

Claims 54-57 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,521,846 B1 (Freda) in view of Sippel.

Freda discloses, a method of attaching a component to a printed circuit board (PCB) comprising: aligning solder balls (11) attached to an array of contact pads on a bottom surface of the component with a corresponding array of interconnections (21) formed on a first surface of the PCB, the array of interconnections comprising at least one via (22) extending from a first signal routing layer on the first surface of the PCB to an electrically conductive layer (24), wherein the at least one via is in electrical contact with the electrically conductive layer; and reflowing the solder balls to electrically connect the array of contact pads to the corresponding array of interconnections. Freda does not specifically state that the via is padless [claim 54]. However, it is well known in the art to use padless vias in PCB as evidenced by Sippel (col., 4, lines 30-40). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to use a padless via as is known in the art and evidenced by Sippel as the via in the invention of Freda. The motivation for doing so would have been to reduce the spaced required of the via and provide the opportunity of increased wiring density (Sippel, col. 4, lines 65-68).

Additionally, the modified invention of Freda teaches, wherein the electrically conductive layer comprises the second signal routing layer and the at least one padless via is in electrical contact with a conductive trace on the second signal routing layer [claim 55], wherein the component is an LGA socket (see col. 3, lines 60-65) [claim 57], wherein the electrically conductive layer comprises a conductive plane, and the at least one padless via is in electrical contact with the conductive plane [claim 62].

Also, regarding claims 56, although the modified invention of Freda does not specifically teach that the BGA has a pitch of 0.8mm or less [claim 56], less a modification would have been trivial to the ordinarily skilled artisan. The motivation for doing so would have been to choose a pitch wide enough to avoid short circuits yet small enough to reduce the footprint of the device, thus freeing up premium board space for additional wiring. Moreover, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering that optimum or workable ranges involves only routing skill in the art. *In re Aller*, 105 USPQ 233.

Claims 33, 34, 38, and 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sippel in view of US 2001/0009066 A1 (Bhatt).

Sippel discloses the claimed invention as described above except Sippel does not specifically state further comprising a via plug formed within the padless via [claim 33]. However, it is well known in the art to fill a plated through hole with a via plug as evidenced by Bhatt ([0009]). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to fill the via of Sippel with a via plug as is

known in the art and evidenced by Bhatt. The motivation for doing so would have been to improve the structural integrity of the device.

Additionally, the modified invention of Sippel teaches wherein the via plug is formed of an electrically conductive material (Bhatt [0027]) [claims 34, 38, 51], wherein forming a via plug within the at least one padless via comprises overplating the at least one padless via to form a via plug of plating material (Bhatt [0028]-[0030]) [claim 52].

Similarly, regarding claims 49 and 50, Sippel discloses the claimed invention as described above except Sippel does not specifically state that forming an array of interconnections on the first surface of the PCB comprises forming an array of interconnection having an array pitch of 0.8mm or less [claim 49]. However, it is well known in the art to form via arrays with pitches in the above range as evidenced by Bhatt (see [0025]). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the via array in the invention of Sippel with a pitch of 0.8mm or less as is known in the art and evidenced by Bhatt. The motivation for doing so would have been to increase the wiring density. Additionally, the modified invention of Sippel teaches, further comprising at least two conductive traces on the first signal routing layer between the at least one padless via and an adjacent interconnection [claim 50].

Response to Arguments

Applicant's arguments filed 5 September 2006 have been fully considered but they are not persuasive. Applicant's argument hinge on the premise "Sibbel (sic) clearly and explicitly describes and depicts padded vias, not padless, in each embodiment,

therefore failing to disclose at least applicant's recited claim limitation of 'at least one padless via". Even though Sippel explicitly states that the vias in the invention may be of a "landless design" (col. 4, lines 30-45). Applicant alleges "although Sibbel (sic) fails to describe a 'landless design in detail, Sibbel (sic) does clearly describe that the vias in a 'landless design' are connected directly to the lands and or pads (conductors) (col. 4, lines 32-35), so the vias of a 'landless design' are padded vias, not 'padless vias". However, this is not how the disclosure of Sippel would be understood by the ordinarily skilled artisan. The term 'landless' would be readily understood by one of ordinary skill in the art as 'lacking a land'. Indeed, Sippel implies this type of structure when stating "It is also suitable for what is known as a 'landless design', i.e., for connecting the conductive material of the holes directly to the conductors, *which saves a considerable amount of space*" (emphasis added). This space savings occurs exactly because this type of design does not have a land. Any other reading of the phrase 'landless design' would be anathema to the term. Clearly, Sippel intends the common meaning of the term in as used in the art, evidenced by Sippel's statement "It is also suitable for what is known as a 'landless design)". Thus, there can be no mistake that the 'landless design' of Sippel is indeed a via which does not have a land/pad.

Thus, Applicant's traversal of the rejection on this ground is deemed unsuccessful.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremy C. Norris whose telephone number is 571-272-1932. The examiner can normally be reached on Monday - Friday, 9:30 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dean Reichard can be reached on 571-272-1984. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCSN



WILLIAM H. MAYO
PRIMARY EXAMINER